MONITORING EMPEROR GOOSE POPULATIONS BY AERIAL COUNTS AND THE PROPORTION OF YOUNG-FALL 2002

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PAUL D. ANDERSON, U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK.
WILLIAM W. LARNED, U.S. Fish and Wildlife Service, Migratory Bird Management, Soldotna, AK.
EDWARD J. MALLEK U.S. Fish and Wildlife Service, Migratory Bird Management, Fairbanks, AK..
CHRISTIAN P. DAU, U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK.
ROBERT A. STEHN, U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK.

Abstract

In 2002, we photographed flocks of emperor geese (Chen canagica) during fall migration at lagoons along the north side of the Alaska Peninsula for the 18th consecutive year. The gray head plumage of young geese differs from the uniform white heads of adult geese. Cluster sampling by photographs within each lagoon and stratified sampling among lagoons provided an unbiased estimate of proportion of young for the entire population. The number of geese counted at each lagoon during an independent aerial survey determined the strata weights. Annual estimation of proportion of young and total fall population size were used to monitor annual production and estimate average survival rate.

Data from 1985-2002 indicated an average 19% of the fall emperor goose population was young birds. The proportion of young ranged from 11-26%. The average annual population growth rate was 0.9985 from 1985 to 2002 as calculated by log-linear regression. The combined-age annual survival rate averaged 0.78

Objectives

Our objectives in this report are to present the results obtained in 2002 and compare these results with data from earlier years. See Butler et al. (1995) for a detailed discussion of the survey and management recommendations.

Methods

Butler et al. (1995) described, in detail, the methods used for both data acquisition and analysis with regards to both the Fall Population Survey and the Proportion of Young Survey. 200 Ectachrome color slide film was used this year with the aperture given priority over shutter speed. 200 ASA film yielded satisfactory slides when used with adequate light and proper panning techniques. We used a 35-135 mm lens with best results at the 135 mm focal length when the birds were 300-500 feet away. The aircraft was flown at approximately 1000' AGL to spot the geese. Once the birds were located we descended to 300-400 feet AGL while photographing. Bright sunlight or high, thin overcast allowed shutter speeds to remain faster than 1/400 sec. Smooth water or dark sand backgrounds provided better definition, making the birds easier to classify. During the 2002 survey 402 slides were taken with an average of 16 birds per slide and a sample of 6,458 birds.

The proportion of young reported is calculated by a count-weighted method. The estimate of percent young in each lagoon is weighted by the population count of that lagoon. The self-weighted proportion of young is also reported. This method assumes each lagoon's population is related to the number of birds in the photos for that lagoon. The results from either method are not statistically different and in this report we use the count-weighted method.

Results

The mean proportion of young in the 2002 fall population was 0.1784 (Table 1). The 2002 Fall Population Survey indicated 78,692 emperor geese between Egegik and Izembek Lagoons from September 29 through October 2 (Table 2). The number of young in the 2002 fall population was 14,039 (Table 3). The proportion of young observed in photographs was highly variable between lagoons and within individual lagoons annually (Table 4) and Nelson Lagoon continues to have the highest total number of geese.

From 1985-2002, the proportion of young ranged from 0.1105(1997) to 0.2554(1995) with 0.1918 being the average. The number of young has averaged 14,688 from 1985-2002 with estimates varying from 6,902 in 2000 to 26,257 in 1990 (Table 3).

The photo analysis estimate of proportion of young was used to partition the total fall population into the number of adults and number of young. The total fall count of the previous year minus adult plumaged birds from the current year yields the number of adults which were loss since last fall's survey. In 2002 this calculation was negative, which would indicate an addition of birds to the population during the non-breeding season, so this is attributed to survey and statistical errors (Table 3).

When considering the sum of the number of birds surviving from year to year (indicated by adult-plumaged birds present in the following years population, i.e. 1986-2002) divided by the sum of the total count of previous years (1985-2001, excluding 1990 and 2002, which are negative) the average survival rate for the past 17 years was 078. The log-linear regression of total population counts from 1985-2002 show population numbers decreasing at an annual rate of 0.9985 (Figure 1).

Acknowledgments

Beginning in 1985, W.I. Butler, Jr. and M.R. Petersen conducted annual aerial photographic sampling to estimate an age ratio of emperor geese along the AK peninsula. W.W. Larned has flown the survey since 1994 with G.R. Balogh (1993-95) T.J. Tiplady (1996-99) and P.D. Anderson (2000-02) as photographers. C.P. Dau has contributed additional photographs from Izembek and Nelson Lagoons. Many others have contributed to data collection efforts over the years, especially W.D. Eldridge and S.F. Cantor. Cooperation and logistic support from the Alaska Peninsula/Becharof National Wildlife Refuge in King Salmon, Yukon Delta National Wildlife Refuge in Bethel and Izembek National Wildlife Refuge in Cold Bay were essential and much appreciated.

Literature Cited

Butler, W.I., R.A. Stehn, R.J. King, M.R. Petersen, and C.P. Dau. 1995. Monitoring emperor goose populations by aerial survey counts and fall age ratio. U.S. Fish and Wildl. Serv., Anchorage, Alas. Unpubl. Rep. 28pp.

Table 1. The number of photographs, number of young and total emperor geese photographed from aircraft in late September and October, 1985 to 2002. The mean and standard error (SE) of the proportion of young in flocks on the north side of the Alaska Peninsula was calculated based on population count weighted and self-weighted strata.

Year	Dates	Young	Total	Number photos	Avg. birds/ photo	Count-weighted Mean	Count-weighted SE	Self-weighted Mean	Self-weighted SE
1985	24 Sep-10 Oct	536	3193	155	20.6	0.1646	0.0258	0.1679	0.0175
1986	30 Sep-15 Oct	1659	6380	311	20.5	0.2538	0.0151	0.2600	0.0126
1987	16 Sep-10 Oct	2417	10177	703	14.5	0.2278	0.0081	0.2375	0.0084
1988	25 Sep-3 Oct	2747	11180	483	23.1	0.2443	0.0092	0.2457	0.0095
1989	23 Sep-3 Oct	2684	12718	390	32.6	0.2194	0.0107	0.2110	0.0107
1990	28 Sep-4 Oct	3418	13541	474	28.6	0.2410	0.0089	0.2524	0.0094
1991	26 Sep-4 Oct	3433	14569	412	35.4	0.2315	0.0090	0.2356	0.0093
1992	26 Sep-4 Oct	2154	14832	403	36.8	0.1550	0.0081	0.1452	0.0079
1993	1-3 Oct	1372	5735	255	22.5	0.2417	0.0134	0.2392	0.0128
1994	26-29 Sep	3974	16881	479	35.2	0.2284	0.0101	0.2354	0.0086
1995	26-29 Sep	2947	11664	361	32.3	0.2554	0.0126	0.2527	0.0119
1996	23-26 Sep	1847	10793	182	59.3	0.1783	0.0144	0.1711	0.0089
1997	30 Sep-1 Oct	1183	11138	205	54.3	0.1105	0.0079	0.1062	0.0068
1998	29 Sep-1 Oct	2185	16544	336	49.2	0.1178	0.0065	0.1321	0.0069
1999	28 Sep,1 Oct	2155	13489	392	34.4	0.1779	0.0103	0.1598	0.0095
2000	25,29 Sep	1016	7748	263	29.5	0.1120	0.0087	0.1311	0.0123
2001	26 Sep, 1 Oct	1410	11186	365	30.6	0.1145	0.0078	0.1261	0.0085
2002	1,2,4 Oct	1174	6458	402	16.1	0.1784	0.0096	0.1818	0.0090

Table 2. Number of Emperor geese counted on aerial surveys in Fall 1985-2002 along the Alaska Peninsula.

Year	Dates	Observers[a]	North Egegik Bay	Ugashik Bay	Cinder Lagoon	Port Heiden	Seal Isl.	Nelson Lagoon	Izembek Lagoon	South side & other	Total
1985	10/10-14	RJK,WDE	0	2058	1474	7700	9260	5081	25155	3895	5161	59784
1986	10/5-11	RJK,WDE	0	65	693	12112	12263	13960	22282	4770	1288	67433
1987	10/2-5	RJK,WDE	24	1920	1289	14610	10362	8310	22056	3716	3349	65636
1988	10/7-12	RJK,WDE	12	816	1188	12844	20116	7440	24400	5438	3911	76165
1989	10/7-12	RJK,LD	15	1195	1841	10456	7769	11173	26558	5133	6589	70729
1990	10/16-20	RJK,AWB	3	89	1833	11910	21677	19990	39420	9439	5133	109494
1991	10/16-20	RJK,AWB	3	1644	1790	11525	12711	15242	22552	4324	5493	75284
1992	10/10-17	RJK,AWB	41	636	701	16059	9108	14034	26663	8070	6983	82295
1993	10/23-26	RJK,DD	-	664	660	12725	9740	8548	27076	5049	6589	71051
1994	10/8-14	RJK,KL	0	1002	730	19046	10421	10465	32376	5908	7138	87086
1995	10/14	RJK,KSB	-	907	1195	23745	10467	9938	32803	2033	9921	91009
1996	9/28	RJK,WDE	-	1533	1325	21367	12042	15426	21657	6041	7627[b]	87018
1997	10/3-4	RJK,CPD	-	2303	650	18944	21717	9778	21633	3416	8228[b]	86669
1998	10/7-9	RJK,EJM	-	796	620	15540	6213	15603	16474	4068	8430	67744
1999	10/1-2	CPD,EJM	-	1714	1538	3834	10621	7539	23220	4426	8992	61884
2000	9/26-28,10/2	CPD,EJM	9	1171	384	6473	10928	13185	17754	5333	6389	61626
2001	9/27, 10/1	CPD,EJM	5	1872	594	8303	4066	15014	21192	4512	4429	59987
2002	9/29-10/2	CPD,EJM	67	1214	700	23483	4178	15302	25505	4161	4082	78692

[a] Observers - Rod J. King, William D. Eldridge, Karen S. Bollinger, Lynn Denlinger, Allen W. Brackney, Donna Dewhurst, Karen Laing, Christian P. Dau, Edward J. Mallek.

[b] The South side of the Alaska Peninsula was not flown these years. The number listed is the average of South side counts for other years plus totals for other bays and shoreline.

\- Segments or area not flown.

Table 3. Total population size, proportion young, annual production of young, and adult population size of emperor geese based on fall survey counts and age ratio of flocks on the Alaska Peninsula.

Year	Total count	Proportion Young	Adults	Young	Mortality number [a]	Survival rate [b]
1985	59784	0.1646	49944	9840		
					9465	0.842
1986	67433	0.2538	50319	17114		
					16749	0.752
1987	65636	0.2278	50684	14952		
					8078	0.877
1988	76165	0.2443	57558	18607		
					20954	0.725
1989	70729	0.2194	55211	15518		
					-12508	1.177
1990	109494	0.2398	83237	26257		
					51638	0.528
1991	75284	0.2315	57856	17428		
					5745	0.924
1992	82295	0.1550	69539	12756		
					28417	0.655
1993	71051	0.2417	53878	17173		
					3855	0.946
1994	87086	0.2284	67196	19890		
					19321	0.778
1995	91009	0.2554	67765	23244		
					19506	0.786
1996	87018	0.1783	71503	15515		
					9926	0.886
1997	86669	0.1105	77092	9577		
					26905	0.690
1998	67744	0.1178	59764	7980		
					18232	0.843
1999	60226	0.1779	49512	10714		
					5502	0.788
2000	61626	0.1120	54724	6902		
					8508	0.862
2001	59987	0.1145	53118	6869		
					-4618	1.08
2002	78692	0.1784	64605	14039		

Average combined age survival: 0.78

[a] Total count minus adult-plumaged birds the following year.

[b] Adults divided by Total count from the previous year.

Table 4. Proportion of young observed in photograph samples during fall staging of Emperor geese in lagoons on the Alaska Peninsula,1985-2002.

	Egegik	Ugashik	Cinder	Heiden	SealIsl	Nelson	Izembek
1985	-	-	0.0868	0.2179	0.2354	0.1528	0.1747
1986	0.1740	0.2684	0.2772	0.1563	0.1642	0.3371	0.3175
1987	-	0.0459	0.2506	0.1952	0.2204	0.2607	0.2303
1988	0.2530	0.1667	0.2734	0.2387	0.1982	0.2538	0.2319
1989	0.2424	0.0925	0.1959	0.1909	0.1295	0.2822	0.2215
1990	0.1556	0.1708	0.3393	0.2237	0.2322	0.2468	0.1659
1991	0.1988	0.1056	0.3018	0.2373	0.2070	0.2246	0.2135
1992	0.0761	0.0885	0.1805	0.1222	0.0686	0.1765	0.2331
1993	0.0940	0.2109	0.2306	0.1709	0.1481	0.2958	0.2977
1994	0.2364	0.1923	0.2351	0.2480	0.2614	0.2195	0.1661
1995	0.2556	0.1278	0.2847	0.2348	0.2165	0.2562	0.2693
1996	0.2695	0.0000	0.1497	0.1649	0.1774	0.2255	0.1557
1997	0.1479	0.0368	0.1034	0.1422	0.1021	0.0915	0.0826
1998	0.1918	0.0000	0.1411	0.1138	0.1505	0.0665	0.1030
1999	0.5544	0.0000	0.0705	0.1574	0.0931	0.2015	0.0285
2000	0.0945	0.0551	0.1893	0.1125	0.0873	0.0614	0.2542
2001	0.1787	0.1443	0.1493	0.0375	0.1128	0.1043	0.1429
2002	0.1889	0.2708	0.1761	0.1785	0.1917	0.1704	0.1722

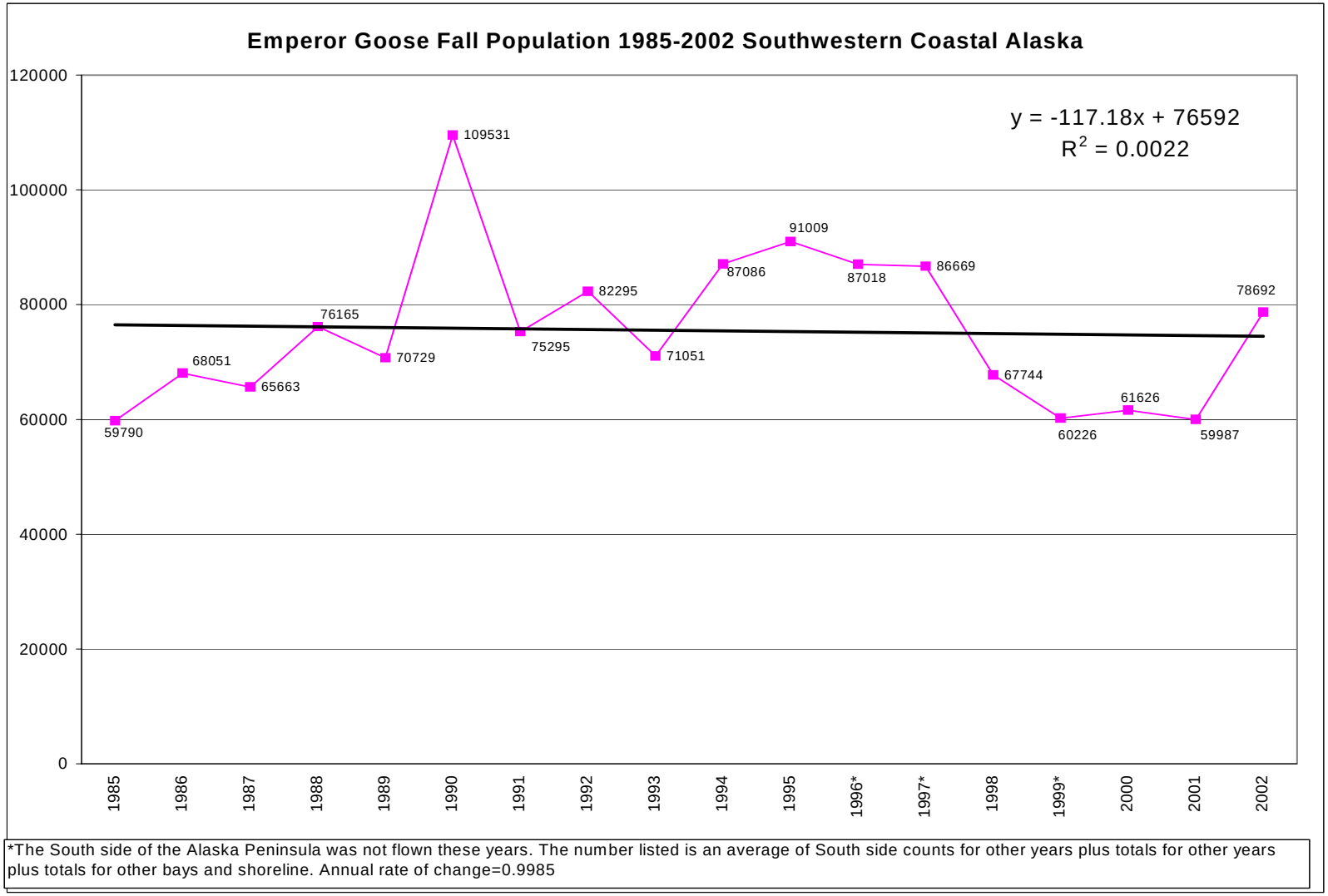

Fig 1. Emperor goose fall population size and trend from aerial surveys of Alaska Peninsula, 1985-2002.